

# CARNIVOROUS PLANT NEWSLETTER

VOLUME 23, NUMBER 3

SEPTEMBER 1994



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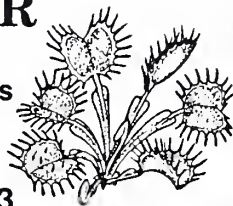
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NEW YORK  
BOTANICAL GARDEN

# CARNIVOROUS PLANT NEWSLETTER

Official Journal of the  
International Carnivorous  
Plant Society

Volume 23, Number 3  
September 1994



Front cover: *Sarracenia leucophylla*. Pastel and color pencil work by Marcia R. Cohen.

Rear Cover: Fernando Rivadavia has submitted much to pages of CPN, and here he is holding an armload of leaves and flowers of *Utricularia reniformis* at Caminho do Mar, Brazil. Photo by unknown photographer, submitted by Ivan Snyder, used with permission of subject.

The coeditors of CPN would like everyone to pay particular attention to the following policies regarding your dues to the ICPS.

All Correspondence regarding dues, address changes and missing issues should be sent to ICPS c/o Fullerton Arboretum, CSUF, Fullerton, CA 92634. DO NOT SEND TO THE COEDITORS. Checks for subscription and reprints should be made payable to ICPS.

All material for publication, comments and general correspondence about your plants, field trips or special noteworthy events relating to CP should be directed to one of the coeditors. We are interested in all news related to carnivorous plants and rely on the membership to supply us with this information so that we can share it with others.

Views expressed in this publication are those of the authors, not necessarily the editorial staff.

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PUBLISHER: The International Carnivorous Plant Society by the Fullerton Arboretum, California State University, Fullerton, CA 92634. Published quarterly with one volume annually. Desktop Publishing: Steve Baker, Rt. 1, Box 540-19AB, Conover, NC 28613. Printer: Kandid Litho, 1077 East Enda Place, Covina, CA 91724. Dues: \$15.00 annually. \$20.00 foreign. Reprints available by volume only © 1994 Carnivorous Plant Newsletter. All rights reserved. ISSN #0190-9215. Circulation 762 (194 new, 568 renewal).

# ICPS Seedbank

C/O Thomas J. Johnson, P.O. Box 12281, Glendale, CA 91224-0981

08/09/94 Update

- |  |   |
|--|---|
| Capsella burso-pastoris                | D. capensis red (2)                     |
| Catopsis                               | D. capillaris (4)                       |
| Dionea muscipula                       | D. capillaris long leaf (2)             |
| Dros. lusitanicum (2)                  | D. coccicaulis                          |
| N. ventricosa #1                       | D. dielsiana (3)                        |
| N. ventricosa #2                       | D. esmeraldae (3)                       |
| N. ventricosa #3 (6)                   | D. glanduligera                         |
| N. vieillardii                         | D. indica 'rd plt, pk flwr'             |
| Pinguicula caerulea (3)                | D. indica 'rd plt, orange flwr' (8)     |
| P. grandiflora f. pallida (1)          | D. indica 'grn plt, pk flwr'            |
| P. moranensis caudata (3)              | D. indica 'white' (1)                   |
| P. vulgaris (7)                        | D. indica (1)                           |
| Sarracenia alata Beauregard Parish (5) | D. intermedia                           |
| S. alata Vernon Parish (10)            | D. intermedia 'Carolina Giant'          |
| S. flava                               | D. intermedia 'Tropical'                |
| S. flava Ben Hill Cty GA               | D. intermedia 'Brunswick, N.C.'         |
| S. flava NC (1992) (2)                 | D. intermedia 'Pine Barrens' (6)        |
| S. leucophylla                         | D. natalensis (2)                       |
| S. leucophylla all red (3)             | D. neesii ssp. neesii                   |
| S. leucophylla Alabama (5)             | D. peltata grn rosette Molgoa, NSW (8)  |
| S. minor (1)                           | D. peltata Kandos Area                  |
| S. psittacina (4)                      | D. peltata NZ (3)                       |
| S. purpurea                            | D. ramellosa (5)                        |
| S. purpurea purp. Copetown Bog (2)     | D. rotundifolia                         |
| S. purp. venosa (1)                    | D. rotundifolia 'Bruce Penn, CAN' (1)   |
| S. purp venosa Louis Burke (2)         | D. rotundifolia 'Haines, AL' (12)       |
| S. rubra                               | D. rotundifolia 'S. Bohemia Czech Rep.' |
| S. X (alata X psit) X alata (5)        | D. sessifolia (5)                       |
| S. X catesbaei (2)                     | D. spatulata (5)                        |
| S. X chelsonii (4)                     | D. spatulata Woronora River, NSW (1)    |
| S. X leuco X alata (2)                 | D. spatulata 'Kansai' (1)               |
| S. X psit X rubra (1)                  | D. spatulata Kanto (2)                  |
| U. chrysantha                          | D. spatulata 'North Island', NZ (1)     |
| U. longifolia (1)                      | D. spatulata rotundate (2)              |
| D. adelae (2)                          | D. spatulata 'New Zealand' (1)          |
| D. admirabilis (1)                     | D. spatulata Formosa (1)                |
| D. aliciae (11)                        | D. spatulata NSW Australia (1)          |
| D. anglica Hawaii (2)                  | D. sp. 'Magaliesburg' (10)              |
| D. auriculata                          | D. trinervia                            |
| D. auriculata NZ (12)                  |   |
| D. binata (10)                         |   |
| D. binata Haraki Plain NZ (2)          |   |
| D. binata North Plains, NZ (2)         |   |
| D. brevifolia (3)                      |   |
| D. burkeana (3)                        |   |
| D. burmanni (4)                        |   |
| D. callisto (10)                       |   |
| D. capensis                            |   |
| D. capensis 'alba'                     |   |
| D. capensis 'Giant' (1)                |   |
| D. capensis 'Narrow Leaf'              |   |

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LOS ANGELES INSECTIVOROUS PLANT SOCIETY meets  
October 22, 1994. For information, call Tom Johnson at (818)  
248-1623. There will be a presentation and plant sale.



## News And Views

The Atlanta Botanical Garden is pleased to announce the addition to its staff of carnivorous plant specialist Ron Gagliardo. Ron is the owner of Hungry Plants Nursery, where he has been producing carnivorous plants using tissue culture techniques since 1983.

At the Botanical Garden, Ron will work in the greenhouses of the Fuqua Conservatory. He will also be upgrading the existing tissue culture facilities, using his expertise to integrate micro propagation into the Garden's native plant conservation projects. His first goal is to establish a protocol for shoot tip culture of *Sarracenia*.

Micropropagation is a cost-effective way to produce plants identical to their "parent". It is usually faster than growing from seed, and unless mutations occur (often due to the artificial growing conditions), the plants are true to type.

After mass-producing plants for export in his business, Ron finds work at the Botanical Garden both relaxing and rewarding. "I enjoy growing these plants for fun rather than for profit," he says. "I also hope to help put the ABG even more on the map with regard to plant conservation."

--L.A. Middlesteadt

**Clyde Bramblett** (18950 S.W. 136th St., Miami, FL 33196-1942)

Clyde has sent us an article from the Miami Herald dated 23 June 1994. It reports ten new cases of the skin fungal disease, sporotrichosis. Regular CPN readers will recall several past articles on this problem, including an autobiographical one from Clyde himself who had the disease.

The ten new cases were all workers at Disney World and were in charge of preparing and caring for the many topiary figures on the property. These are horticultural projects in which an animal or cartoon character three-dimensional outline is made from wire, the form is then filled with damp sphagnum and various creeping or vine plants are planted on the surface. These grow and with proper trimming result in an animal or character that appears to be carved from plant material.

To recapitulate, the problem is the sphagnum, a long fiber dried product from any of several sources. Many batches contain spores of the fungus *Sporotrichum schenckii*. If the worker has a minor scratch or other break in the skin, the fungal spores can enter and produce a local lesion. The infectious organism then spreads up the extremity through draining lymph channels, resulting in more lesions strung out along the extremity. If not treated (a long, distasteful process) and in susceptible patients, the disease can then spread to internal organs such as the lungs where it is potentially fatal. The disease is generally rare and doctors may initially misdiagnose early stages through lack of familiarity. In 1988, 84 people in 14 states had sphagnum related sporotrichosis.

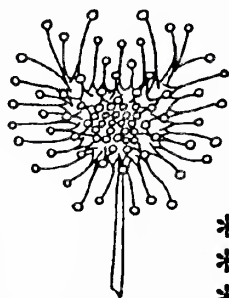
Since we have new subscribers, we take this opportunity to warn about how you handle dried long fiber sphagnum. It is always best to wear heavy rubber gloves when handling it. Avoid raising dust when it is dry, or wear a mask. If you have handled dry sphagnum and acquire a sore on one of your hands or arms that persists beyond a few days, see a physician, and don't be afraid to suggest ruling out sporotrichosis.

Site #	Site	Temp. (C)		Soil Temp. C	Water pH
		Air	Water		
1	Gasquet	20	15		
2	Hunter Creek	19	13		8
3	Flycatcher Springs			17	
4	Snow Camp Meadow (full sun)	29	15		
	Snow Camp Meadow (shade)	15	10	10	
5	Saddle Mt.	26	10	15	
6	Huntley Springs				7.5
	Average	22	13	14	7.75

## OOPS!

Through an inadvertent production error, We omitted a table from an article by Phil Sheridan and Bill Scholl on *Darlingtonia*, CPN 22:70-75, 1993. The table dealt with various environmental factors in the natural habitat of the species and is now produced below. We regret any inconvenience to the authors and readers that this oversight has caused.

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# More knowledge about *Nepenthes rhombicaulis*

Rudolf Schmid-Hollinger, Quellmattstrasse 28, CH-5035 Unterentfelden, Switzerland

*N. rhombicaulis* was described in 1973 by Kurata. In 1993, I had the opportunity to climb on some Pangulubao chains near Lake Toba, North Sumatra, and to see *N. rhombicaulis* in several places. I discovered the very rare pitcher of the climbing stem, until then not known. Following are some more details about this species.

Pitchers of the climbing stems are very rarely developed. The form of these pitchers is quite different (Fig. 1) from the form of the ground pitchers (Fig. 2). Climbing pitchers are also broad near the base and ventricose, but the upper part of the pitcher is more elongated, tubiform to slightly infundibuliform towards the mouth. The whole shape is slender compared to ground pitchers. Pitchers of short shoots situated laterally on climbing stems (Fig. 3) some meters above ground are very similar, but the colors are strikingly different.

Climbing stem pitchers: Ventricose part yellow-green, upper part slightly spotted (pale red spots).

Short shoot pitchers: Whole pitcher with clear red spots.

There are also differences in the formation of the peristome: Short shoot pitchers have a broad, undulated peristome as in ground pitchers. Pitchers of elongated stems have small, reduced peristomes.

Digestive glands: There is no great difference between ground and hanging pitchers. In both cases the distribution, shape and number of digestive glands are similar, 150-300 glands per 1 cm<sup>2</sup>, dark, transversely oriented. In the upper digestive zone they are strongly overarched by the epidermis; in the base of the pitcher they are more round and nearly free.

Teeth of the peristome: The peristome, incurved into a small neck below the lid shows visible teeth in ground pitchers, 1-2 (-3) mm long. Hanging pitchers have strongly reduced teeth according to the finer peristome.

Wings: Elongated stem pitchers show reduced wings with few fimbriae.

Nectar glands: Ground pitchers have few to 100 glands on the underside of the lid. They are flat, dark, surrounded by a bright rim and of different size. In the middle of the lid base they are longitudinally oriented, at the side they are smaller and often transversely oriented. Pitchers of elongated stems have several hundred nectar glands, which are smaller and distributed regularly. Only the small margin has no glands.

These differences in number and distribution of nectar glands on lids of ground and hanging pitchers seem to follow a general rule (see *N. madagascariensis*, Schmid-Hollinger 1979).

## Literature

Danser, B.H. 1928: The Nepenthaceae of the Netherlands Indies. Bull. Jard. Bot. Buitenzorg ser. 3, 9, 249-438.

Kurata, S. 1973: Nepenthes from Borneo, Singapore and Sumatra. Gard. Bull. Sing. 26, 227-232.

Schmid-Hollinger, R. 1979: Nepenthes-Studien V, Die Kannenformen der west-lichen Nepenthes-Arten. Bot. Jahrb. Syst. 100, 3, 379-405.



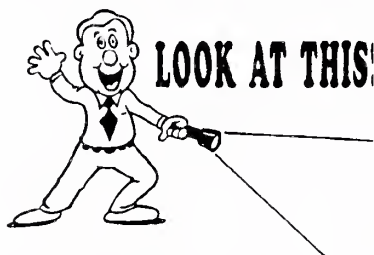
Fig. 1 : The very rare elongated stem pitcher



Fig. 2: Ground pitchers with broad, undulated peristome



Fig. 3: Short shoot pitcher (left) and elongated stem pitcher (right), both hanging some meters above ground



**LOOK AT THIS!**

Gordon Snelling says that Southwest Carnivores is closed for business until further notice. **Please no orders.**



**MICHAEL SZESZE** (3431 Bayside Forest Court, Huntington, MD 20639) is a teacher who has been working on "A Teacher's Guide to Carnivorous Plants" which is now in its second edition. Among the many activities described in the Guide is this wordsearch puzzle with a list of words hidden in it. So you and the kids get your pencils and see what you can find! (Teachers write Michael for further info on his Guide).

## CARNIVOROUS PLANT WORDSEARCH

by Michael Szesze

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P W I V E N U T R I C U L A R I A S P C
P I N G U I C U L A E T I N T M A P O R
I L T A N I S O C O P R V A I D O B C R
N M E C W F U N D E H W E R A Q R L O O
C I R T H A T B A R A P N P S A C A N T
A N I F L E V A O U L M T S L N P D S U
R G N I S L R O V G O A S T E N I D S N
N T S L P D G P A R T Y L F S U N E V D
I O E I T E N T L I U Y F E A F F R E I
U N C F S I U R O A S R F L A V A W S F
O A T O I F M N F S N A G E M I N O R O
R S F R R I S U N P I T C H E R V R W L
O W I M A D U N E H A I D E M R E T N I
U I O I E O M N C A P I L L A R I S D A
S L R S N M I D I G E S T I O N E I I H
D A R L I N G T O N I A G S D I O N E A
E S O E L R D E A U L I E U G N E I P N
W E M V H E L I A M P H O R A C S P A I
S E M I A C T I V E T K W E A S J C H C
D R O S E R A L S N T V A R E V I T C A
M O O S B U T T E R W O R T N D X S R T
Y T W A E R U P R U P A P E I T H B E T
E U S P N W E D N U S O U C M R U T N I
S N I A T N E R E T A W N I A R O S F S
I N S E C T I V O R O U S T I V T R A P

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acidic, active, adaptation, bladderwort, bog, butterwort, carnivorous, cobra lily, capillaris, cephalotus, darlingtonia, digestion, dionaea, drosera, fen, filiformis, flava, heliamphora, intermedia, insect, insectivorous, linearis, minor, modified leaf, nepenthes, passive, peat, pinguicula, pitcher plant, pocosin, psittacina, purpurea, rainwater, rotundifolia, rubra, sarracenia, semi active, sphagnum, sun, sundew, sun pitcher, trap, utricularia, venus, flytrap, wilmington



# DON'T CONFUSE SPHAGNUM MOSS WITH PEAT MOSS

By Gerry Hood

President, Canadian Sphagnum Peat Moss Association

You may have read about a fungal disease called *Cutaneous Sporotrichosis*, a chronic infection identified by skin lesions. The fungus which causes this disease has been found in several kinds of organic material and, because in extremely rare cases this disease can cause death, gardeners are rightfully concerned about protecting themselves from contracting it. Unfortunately, however, some of the information circulating about how gardeners can contract this disease has been inaccurate. It confuses two separate products; one of which is known to carry the fungus and one of which does not.

One of the materials known to carry the sporotrichosis fungus is **sphagnum moss**. Most frequently used by the floral industry to line wire baskets, this product frequently is being confused with sphagnum peat moss, a soil conditioner known for its ability to bind sandy soils, loosen clay soils and retain water. The difference is an important one. While there have been cases of sporotrichosis resulting from handling sphagnum moss, I'm aware of no cases as a result of handling sphagnum peat moss. Sphagnum moss and sphagnum peat moss are *not* the same product, as many avid gardeners know.

*Sphagnum moss* is the living moss that grows on top of a sphagnum bog. The fungus *sporotrichum schenckii* is known to live in this growing moss.

*Sphagnum peat moss* is the dead material that accumulates as new live material grows on top and exerts pressure on the peat moss below. The fungus is not known to live in the levels of a sphagnum bog where peat forms. Harvesters of horticultural peat moss remove the top few inches of the live sphagnum moss and only harvest the peat from the lower layer.

"Living" sphagnum moss is used in the floral industry to make wreaths and to line hanging baskets. Workers in that industry have been warned to protect themselves with gloves and heavy clothing to avoid puncture wounds or scrapes. Gardeners wishing to use sphagnum moss to create their own baskets or for other uses should simply follow the same advice: Wear gloves and long sleeves to prevent coming into contact with the dried moss. No similar warning appears on Material Safety Data Sheets (MSDS) for handling sphagnum peat moss.

Gardeners worldwide use sphagnum peat moss as a soil amendment because its unique cell structure enables peat to:

- Aerate plant roots by loosening heavy clay soils;
- Add body to sandy soil; and
- Save water by absorbing and holding moisture.

Peat moss is not only effective, it's organic and safe to use.

(EDITORIAL NOTE: To clarify terms for our readers, sphagnum moss is so-called long fiber sphagnum sold dried in bales, or living sphagnum collected in the field. Sphagnum peat moss is the brown Canadian peat which is partially decomposed sphagnum found in deeper layers of sphagnum bogs. So far, peat has not been incriminated in cases of sporotrichosis.)

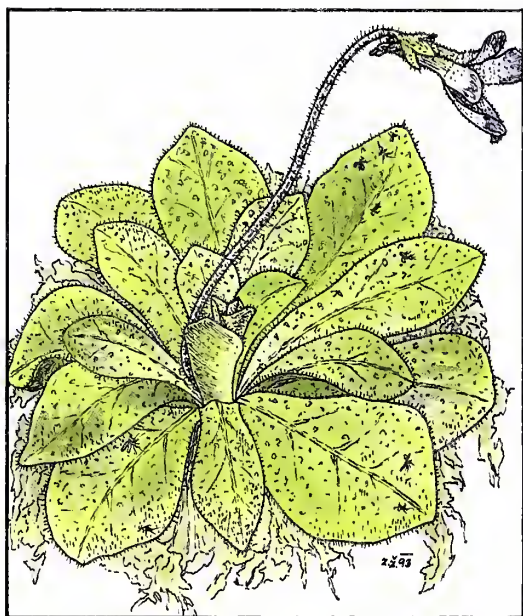


Fig. 1— *Pinguicula agnata*. Intermediate leaves, late autumn, in flower. Pen and ink drawing with water color by Zdenek Zacek.

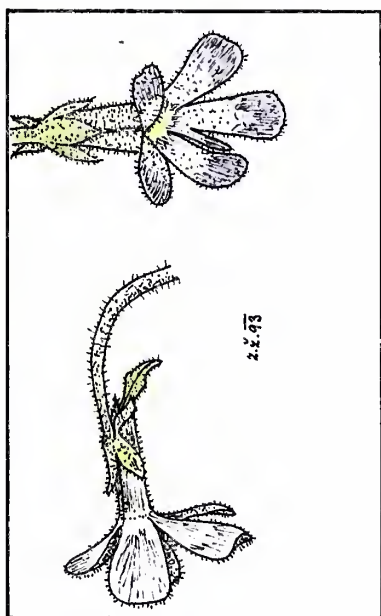


Fig. 2— *P. agnata*. View of asymmetric flower.

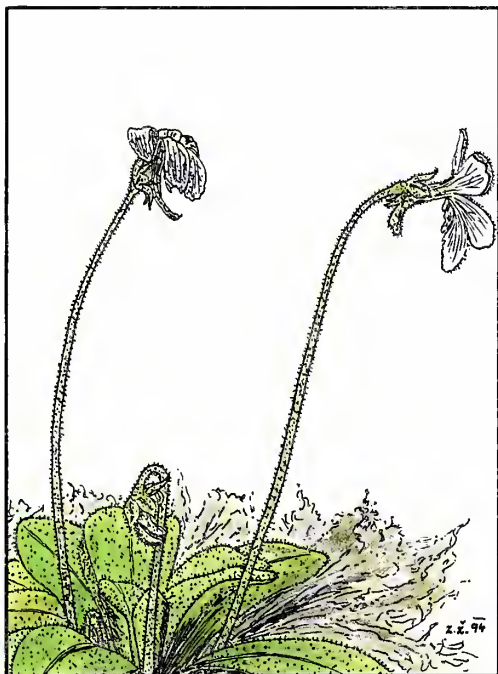


Fig. 3 — *P. agnata*. Multiflowered winter rosette.

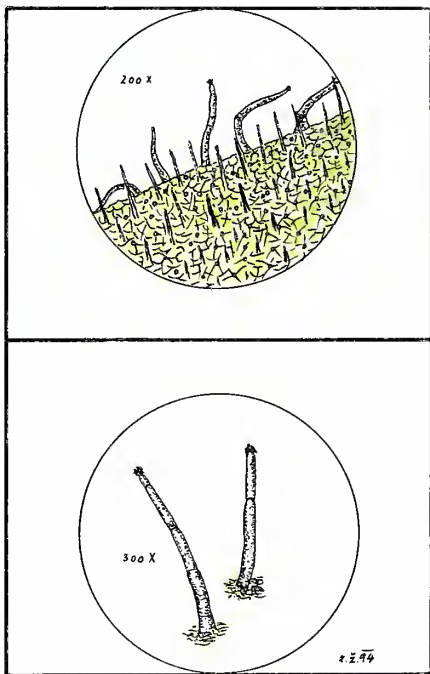


Fig. 4— *P. agnata*. Microscopic views of glands on leaf surface.

# LETTER FROM THE CZECH REPUBLIC — II

by

Zdenek Zacek (Ustavni, 139, P8, Bohnice, 18100, Czech Republic)

Many greetings from Prague, the capital of the Czech Republic. I am here again to write about and illustrate through drawings another carnivorous species I am growing, the Mexican *Pinguicula agnata*. have been successfully growing this butterwort for several years.

There are two seasonal leafy rosettes. The summer one has larger, longer leaves often overgrowing the edges of the pot. This growth variant never seems to flower. The winter rosette consists of much smaller, shorter almost succulent leaves and seems to flower continuously.

The flowering seasonal phase is shown on the cover. Flowering began in early October while, as the drawing shows, the leaves were in a somewhat intermediate stage, going into the winter phase. Brown remnants of summer leaves are seen around the edges of the pot.

As seen in the figures, all parts of the flower are hairy including the corolla. The spur is short and wide and quite flat. As soon as one flower fades another is starting to develop or open. In the midst of the flowering season, more than one open flower may be seen often, one flower to a stalk.

The corolla persist for several weeks, the stalk and calyx for several more weeks. The detail flower drawings show variation in petal symmetry or lobing. This winter flowering continues until spring when large leaves begin to form and flowering ends.

Both summer and winter leaves seem to be carnivorous in that they trap insects as shown in the figures. These are passive traps and even the glandular hairs do not move as they usually do in droseras.

To examine the adhesive surfaces of the leaf blades more closely, I placed portions under my field microscope to produce the detail drawings of these glands. The green background is of course chlorophyll. There are both stalked and sessile glands, the latter unstalked and directly on the leaf surface for enzyme secretion and absorption of digestion products. A look at the magnified surface gives a good impression of the chilly, terrifying forest awaiting a small insect.

I have never observed spontaneous vegetative reproduction or budding in this species which has been seen in some other Mexican butterworts.

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# The Hawaii population of *Drosera anglica* — a tropical twist on a temperate theme

Sam Gon III, 1604 Olalahina Place, Honolulu, HI, USA

Of two species of CPs growing in the wild in the Hawaiian Islands, one is a naturalized introduced aquatic bladderwort (*Utricularia gibba*), while the other is the only indigenous Hawaiian CP species: *Drosera anglica*. Although most treatises on world CPs describe the distribution of *D. anglica* as “widespread temperate”, and overlook the tropical Hawaiian population, in recent years the tropical-adapted variety of *D. anglica* from Hawaii has found its way into a number of ID’ growers’ collections. One interesting attribute of the Hawaii variety is its apparent ability to forgo winter dormancy. This article describes the distribution, habitat and likely origins of Hawaiian *D. anglica*, and discusses the transition from a cold temperate habitat to a tropical one. It ends with a few cultivation notes from my successful efforts to raise and propagate this variety under tropical conditions.

The Hawaiian populations of *D. anglica* are found only in the bogs of the Alakai plateau on the island of Kauai. These bogs occur in a virtually trackless part of the island’s interior, at elevations from 4,000 to about 6,000 feet above sea level, putting them well within the Hawaiian montane zone. This zone, while generally frost-free, may see nocturnal winter temperatures just above freezing, and even during summer months, nighttime temperatures often fall to below 45° F. Nonetheless, during the day, conditions can be quite balmy and sunny, exceeding 75° F.

The Kauai bogs are dominated by a variety of Hawaiian sedges, herbs and shrubs. The sedges are generally species of *Carex*, *Rhynchospora*, or *Oreobolus*. While mosses such as *Sphagnum* are absent in most Hawaiian bogs, and thick accumulations of peat are lacking, the highly acid, water-saturated conditions that mark bogs elsewhere in the world certainly apply, as does the stunted nature of plants growing in the bog habitat. Hawaiian sundews, aptly called *mikinalo* in the Hawaiian language (*miki*: to suck + *nalo*: flies) are very common in certain bogs of the Alaka’i plateau. Colonies of tens to hundreds of individuals can be found growing along the edges of mucky pools in depressions protected from the wind but more commonly, be sundews grow in close association with sedge tussocks, sending delicate tentacled leaves out between the pincushion-like blades of *Oreobolus*. In such associations it is impossible to extricate the sundew from the sedge, and most hikers walking along the Alakai Swamp Trail don’t even notice that many of the ubiquitous sedge tussocks they see bear associated sundew partners. The tough sedge protects its sundew associates from weather conditions in the Alakai, which can be quite harsh: heavy rainstorms and sweeping winds at gale velocities. An unprotected sundew would be beaten into the mud, then swept away in a torrent, but the sedge provides the physical support and bears the brunt of the weather.

The location and ambient conditions in the Alakai bogs go a long way toward answering another question: How could a cold-temperate *Drosera* speck take to a tropical latitude such as that of Hawaii? The answer may be that the original colonist, far from finding a tropical climate, actually encountered conditions not so dissimilar to its original temperate home: near-freezing winters, cool ambient temperatures at montane elevations, and acidic open sedge bogs. As the colonist established itself in the higher bogs, its descendants could have gradually evolved tolerance of warmer conditions, even forgoing winter dormancy altogether, as they spread into bogs and



acid wetlands at lower elevations on Kauai.

The Hawaiian Islands are over 2500 miles from the nearest continent in any direction, so how did *D. anglica* get to the bogs of the island of Kauai? There are two likely possibilities. The high-altitude jet stream runs directly from Japan to the Hawaiian Islands during parts of the year, and small seeds of the Japanese populations of *D. anglica* may have been blown over that way and settled out on Kauai. The other route involves a migratory bird, the Pacific Golden Plover (*Pluvialis fulva*), that yearly migrates from Alaska and Canada to Hawaii. When the birds arrive in Hawaii, they set up territories on lawns and other open flat habitats. One of their favorite haunts is open sedge bogs. In their non-stop flight from temperate North America to Hawaii, it is easy to envision seeds of *D. anglica* stuck in the mud on the feet of a plover being planted in its first landfall, a bog in the Alakai plateau of Kauai, the northernmost of the main Hawaiian Islands.

Whether by jet stream or plover, the colonization of *D. anglica* to Hawaii must have been a one in a million occurrence. If the introductions were more frequent, there would have been no opportunity to evolve tropical habitat tolerance, since that presumably would have required isolation of the gene pool of *D. anglica* in Hawaii for sufficient generations to allow for divergence. Thankfully for CP enthusiasts in tropical settings, the tropical adaptations of *D. anglica* in Hawaii allows for their cultivation in warm climes without heroic measures, such as seasonal stints in refrigerators.

---

## The correct names for the subspecies of *Sarracenia purpurea* L.

Martin Cheek  
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The article by Reveal (1993), reviewed in CPN 22(3):78, claims that owing to McDaniel's lectotypification (1971), the universally used nomenclature for the northern and southern subspecies of *S. purpurea*, the most widespread of all the American pitcher plants both in the wild and in cultivation, must be radically changed. This article, requested by CPN, examines the issue.

*Sarracenia purpurea* L., described by Linnaeus (1753: 510) was first treated as two entities by Rafinesque (1840) who treated the northern ('Canada to Virginia') element as *S. gibbosa* and the southern ('Virginia to Florida') variant as *S. venosa*. Wherry (1933) pointed out that the two taxa meet in New Jersey rather than in Virginia. He also noted that, although there are real differences between the two taxa, they are not sufficient for specific status, and treated them as subspecies: *S. purpurea* ssp. *venosa* (Raf.) Wherry and *S. purpurea* ssp. *gibbosa* (Raf.) Wherry. Wherry later (1972) adjusted the nomenclature to follow the International Code of Botanical Nomenclature (the Code), which rules that, where there are more than one infra-specific taxa of the same rank within any species, that to which the nomenclatural type of the species belongs should take the name of the species, that is, it should be autonomic. Thus one of the subspecies of *S. purpurea* must be *S. purpurea* ssp. *purpurea*. The question is, to which subspecies should the type of Linnaeus's species be attributed: the northern or the southern subspecies? Wherry (1972) indicated that 'although Linnaeus preserved no type specimen, his discussion indicates that his

species represented the northern of these, which according to common usage should therefore bear the name *S. purpurea* subsp. *purpurea*; for the southern one the published combination is *S. purpurea* ssp. *venosa* (Raf.) Wherry.'

However, McDaniel in his monograph of the genus (1971) was first formally to choose a nomenclatural type (lectotype) for *S. purpurea*. It should be remembered that a nomenclatural type is the element (specimen or illustration) to which the name of a taxon is permanently attached. This 20th Century American concept, now internationally agreed upon, has helped stabilize names. Since earlier authors, such as Linnaeus, did not use this concept, types of their names have been selected retrospectively, that is, lectotypified, by later taxonomists. This process is governed by the Code. In the absence of a Linnaean specimen, McDaniel chose a plate from the protologue, as is permitted by the Code. He chose plate 70 of Catesby's *Natural History of Carolina, Florida and the Bahamas*, one of the works cited by Linnaeus in his protologue. Unfortunately, that plate depicts the southern subspecies of *S. purpurea*, which according to the Code, should then have become known as *S. purpurea* ssp. *purpurea*, the northern becoming *S. purpurea* ssp. *gibbosa* (Raf.) Wherry, or, if treated as a variety, *S. purpurea* var. *terrae-novae* de la Pylaie as McDaniel pointed out (1971:24).

McDaniel's work was largely ignored, possibly owing to the obscurity of its publication as a Bulletin of the Tall Timbers Research Station, a series of publications known more for work on ornithology than anything else. By contrast, Wherry was followed. The beginning of the 1970's saw an upsurge in interest in carnivorous plants that had not been seen since the 19th Century. A flood of popular books came forth. Initially they followed Wherry's 1933 nomenclature (Schwarz (1974), J. & P.A. Pietropaolo (1974), Swenson (1977)), later the nomenclature suggested by his 1972 publication (Schnell (1976), Slack (1979, 1986) J. & P. A. Pietropaolo (1986), Temple (1988), Cheers (1983, 1992)). In addition, the twenty-one volumes of the *Journal of the International Carnivorous Plant Society* and the 17 volumes of the *Carnivorous Plant Society Journal* have followed Wherry's nomenclature and overlooked that of McDaniel. Finally, the many specialist carnivorous plant nurseries in North America, Australia, Europe and Japan without exception follow Wherry in utilizing his nomenclature for the two subspecies where, as is usually the case, they are distinguished. The southern subspecies is probably the most popular American pitcher plant in cultivation and is sold as a house plant by the tens of thousands by at least one Dutch nursery. I have not been able to find a single instance of McDaniel's nomenclature, the legal one according to the Code, being adopted for infra-specific taxa in *S. purpurea*. It was not until 1993, that Reveal drew attention to this state of affairs and pointed out that McDaniel's names for the infra-specific variants of *S. purpurea* are correct and must be used.

Reveal (1993) reviews the acceptance of Wherry's usage by systematic authors. In general they are less consistent than horticultural authors in accepting sub specific rank for the infra specific taxa. Although Bell (1949) was inclined to reject Wherry's distinction between the northern and southern infra-specific taxa, on the grounds that he suspected that the differences are 'more environmental than hereditary', he admitted that if the two came true from seed (which we now know to be so) 'the two subspecies of Wherry would seem to be justified.' Reveal reports that Fernald (1950), Gleason (1952) and Gleason & Cronquist (1963, 1991) accept Wherry's distinction, as do, in Canada, Rousseau (1974), Taylor & MacBride (1977) and Scoggan (1978), though using the infra-specific epithet 'purpurea' at the variety or form level rather than the sub specific. Scoggan (1957), Looman & Best (1979), Porsild and Cody (1980), Moss (1983) and Hinds (1986) defined the range of *S. purpurea* so as to exclude that of the southern taxon, according to Reveal, thus also supporting the distinction

between the two taxa, perhaps implying specific rank for the southern subspecies.

The two taxa are usually distinguished in the exterior indumentum and shape of the pitcher which is felty and fat in the southern taxon, glamorous and slender in the northern. They also differ in the margin and dimensions of the pitcher lid which in the southern subspecies is strongly crinkled and with wings easily meeting over the mouth, in the northern subspecies often entire, with wings not overlapping. These characters are well known to those who grow the plants. Less well known is that different species of mosquito inhabit each of the two taxa: *Wyeomyia smithii* inhabits the northern taxon, *W. haynei* the southern (cited in Wherry, 1972). From my own observations, the northern taxon usually has a vertical, rather than a horizontal rhizome and tends to have more numerous pitchers (6-10 rather than 4-5) per crown than the southern subspecies. A form of the northern subspecies lacking anthocyanin, *S. purpurea* subsp. *purpurea* f. *heterophylla* (Eaton) Fernald, has long been recognized in horticulture and can be locally dominant from New York to Nova Scotia. A most distinct botanical variety of the southern subspecies, in the gulf coast region, *S. purpurea* subsp. *venosa* var. *burkii* D. Schnell (Schnell 1993) has long been known (Wherry, 1933) under cultivation as *S. purpurea* subsp. *venosa* 'Louis Burk'. It is recognized by short peduncles, white stigma and pale pink petals.

To abandon, as Reveal suggests, the well-known and widespread usage of the infra-specific names of *S. purpurea* in favour of that resulting from McDaniel's lectotypification, would cause universal dismay and confusion. Accordingly I am proposing to conserve *Sarracenia purpurea* with a new type, under Art. 14 of the new, unpublished Tokyo (1993) Code which permits the conservation of any species name with a new type. In this case, the obvious two choices seem to be a Kalm specimen at Uppsala and a plate in a work by Clusius (1601). Both represent the northern subspecies and conserving either as lectotype over that of McDaniel would protect existing usage of names.

Kalm was a student of Linnaeus who collected specimens for him from New York into Canada (the range of the northern subspecies). According to Stearn (1957:114), his specimens were available to Linnaeus and used in preparation of the *Species Plantarum*. Kalm generally collected in sets of three. The first went to Linnaeus and I presume that this may well have been the specimen or one of the specimens that occupied the now mysteriously empty *Sarracenia* cover in Linnaeus's herbarium (Jackson, 1907). The second went to Kalm's private herbarium (destroyed by fire), the third to Queen Ulrica of Sweden, thence to the University of Uppsala. This sheet survives. It is favoured as an alternative lectotype by Reveal (1993), though as he points out that there is no proof, in the form, for example of an annotation, that it was seen by Linnaeus. Otherwise it would easily be adjudged the most suitable element for lectotypification over, for example, the Catesby plate.

The plate of Clusius is eligible for consideration because it is cited by Linnaeus in *Hortus Cliffortianus* (1737), the precursor to the great *Species Plantarum* of 1753 which is the starting point for all plant names. It clearly represents a specimen of the northern subspecies in its vertical rootstock, numerous, slender pitchers with short, broad wings to the hood. As an undoubted 'original element', it takes precedence over the Kalm specimen as a candidate for typification.

If the proposal to conserve with a new type is accepted by the Committee for Spermatophyte and the General Committee of the International Association of Plant Taxonomy (IAPT), then the cataclysmic upset will be avoided and we will legally be able to call the northern subspecies *S. purpurea* L. ssp. *purpurea* and the southern subspecies *S. purpurea* ssp. *venosa* (Raf.) Wherry as we have long been doing. The adjudication might take 12 months from the date of publication of the formal proposal

in *Taxon* (the journal of the IAPT). In the meantime I strongly propose that the existing usage be maintained by growers and that Reveal's recommendation be laid aside for the present.

## ACKNOWLEDGMENTS

I am grateful to Dick Brummitt and Nigel Taylor for advice.

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# Carnivorous Plants of New Zealand: A Review

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The following is an account of the native carnivorous plant species of New Zealand based entirely upon available literature. Seven species of *Drosera* and five species of *Utricularia* occur naturally in New Zealand, and all but two (*D. stenopetala* and *U. delicatula*) are found also in adjacent eastern Australia or New Caledonia. Despite this, many of these species have evolved in isolation into locally endemic forms which may warrant sub-specific status. This account is intended to only be a review of these New Zealand carnivorous plants and, by its very nature, is general and incomplete. I hope that it will reveal the considerable gaps in our knowledge and prompt the publication of supplementary observations from those in New Zealand.

New Zealand is an island nation, in the south-west Pacific, which consists of two main islands - the North Island and South Island, with smaller islands to the north and south, of which the largest is Stewart Island (Fig. 1). Geologically it is a mosaic of fragments of Gondwana which rifted from the eastern margin of Australia 80-60 million years ago (M.A.), and from Marie Byrd Land (Antarctica) 80-65 M.A. Present-day New Zealand represents only a small percentage of this micro continent, most of which is currently below sea-level. The islands lie at the tectonic plate boundary of the Indo-Australian and Pacific Plates, the interaction between them has resulted in the Southern Alps of the South Island, and the active volcanism in the North Island (White, 1990).

The native carnivorous plant species are described below, and their approximate distributions are shown in Figure 2.

## *D. arcturi*

*Drosera arcturi* is a rhizomatous, sparsely-rosetted winter-deciduous species. Three to six linear leaves are produced from October to February, and grow up to 12 cm long by 1 cm wide, with a short, but indistinct non-glandular petiole. The rhizomes grow to 20 cm long and are mostly buried in the substrate (Hooker, 1853). Growing leaves are folded along their length and grow erect (Gibson, 1992a), which differs from the predominant modes of leaf growth in the genus where the blade is applied to the petiole, or uncurls (Juniper et al. 1989). The scape is produced from late November into December and bears a single, or very rarely two, white-petalled flower(s), which may be pollinated by moths. Plants become dormant in early autumn and the summer leaves and scape die. Seed is shed in early autumn and germinates the following spring when the growth recommences (Hooker, 1853; Cotter, 1987).

This species is found throughout alpine and sub alpine areas, to 1500 metres (Burrows, 1986), of the North and South Islands (Fig. 2A), extending to sea-level on Stewart Island (Hooker, 1853). The main habitats are sphagnum bogs, which they dominate, or peat-based bogs where they grow amongst grasses and sedges. It may be found in association with *D. spatulata*, *D. stenopetala* and *U. monanthos*, as at the top of Arthur's Pass, South Island (Boon, 1988). It is also found in Australia, on peaks in the Snowy Mountains, and throughout central and south-west Tasmania (Erickson, 1968).

## *D. auriculata*

*Drosera auriculata* is the most widespread of the two tuberous *Drosera* species in New Zealand (Harris, 1988). It commences growth from May, and initially forms a basal rosette, or emerges in mid-winter and forms an erect, or partially trailing, stem immediately which grows to 60 cm tall (Maulder, 1982). Plants often branch in the upper portion of the stems and each terminates in an inflorescence. The flowers have black-dotted, hairless sepals (Salmon, 1991a), and pink, rarely white petals, and are

produced from August to November, prior to the plant becoming dormant (Harris, 1988; Maulder, 1982). In some situations a flowering plant may resprout from its base and extend its growing season (Salmon, 1991a).

*Drosera auriculata* is found throughout the North Island, especially in the north-west (Rowe, 1986) and in the north of the South Island (Hooker, 1853) (Fig. 2B.). It grows abundantly in moist clay (Jerebine, 1987; Harris, 1988), in the better-drained margins of swamps (Salmon, 1988; Rowe, 1986), and in disturbed areas in woodland (Irving, 1988). It is commonly found with, or near, *D. binata*, *D. peltata*, *D. pygmaea*, *D. spatulata*, *U. delicatula* and *U. novae-zelandiae* (Anon., 1987; Rowe, 1986). This species is also found in south-eastern Australia and Tasmania (Erickson, 1968).

### ***D. binata***

*Drosera binata* is a distinctive, rosetted perennial with erect, petiolate dichotomously branched filiform lamina, which may branch further. One to three scapes are produced between late Spring and late Summer. They typically grow 30 to 40 cm tall, and have white-petalled flowers to 1.5 cm diameter (Salmon, 1991a). Plants are dormant from March to July (Maulder, 1982).

The leaves vary in height from 10 cm to over 100 cm, and the lamina may have two to twenty lobes, and spread over 30 cm. The tallest plants grow amongst dense herbage and produce significantly shorter leaves in open ground (Maulder, 1984a). Up to three variants may occur in New Zealand, based tentatively on leaf division alone. *Drosera binata* "t-form" has been recorded from Northland (Rowe, 1986), but is probably subordinate to *D. binata* var "dichotoma" which has two to four lobes per leaf. *Drosera binata* var. *multifida*, with evenly divided leaves with up to 14 lobes, has potentially been found in single swamp (Maulder, 1984a).

*Drosera binata* is widespread in New Zealand (Fig. 2C.) and is found in the North, South, Stewart and Chatham Islands (44 00'S, 176 40'W) (Hooker, 1853), and also occurs in eastern Australia (Erickson, 1968). It grows on clay banks, in swamps, creek beds and on wet rock faces, usually in a sunny location (Maulder, 1984a). Plants may even be found growing under a few centimetres of water in the wettest parts of swamps and the margins of lakes (Salmon, 1991a). It is often found with, or near, *D. auriculata*, *D. pygmaea*, *D. spatulata*, *U. delicatula* and *U. novae-zelandiae* (Salmon, 1991a; Anon. 1987; Rowe, 1986). This species appears the most resilient to polluted water and weeds and remains on degrading sites longer than other native carnivorous plants (Salmon, 1991).

### ***D. peltata***

Tuberous *D. peltata* has only recently been discovered in New Zealand, and is potentially a recent arrival from Australia. To date it has been found in a limited distribution in the far north of the North Island, north of Auckland (Fig. 2B.). Plants are golden green in colour, usually form a basal rosette, grow to approximately 20 cm tall, have very few branches which terminate in inflorescences. The flowers have pink petals, hairy sepals, and the globular fruits produce small round seed. They produce daughter tubers, which apparently *D. auriculata* does not (Maulder 1991; Salmon, 1991a). No details of the growing season have been published but plants probably commence above ground growth in March, stem growth in July and flower from August to October. This species often grows with *D. auriculata* and *D. pygmaea* in grassland (Maulder, 1991; Salmon, 1991a).

This species also occurs in south-eastern Australia, Tasmania, part of south-west Western Australia, and throughout South East Asia to Japan and India, and possibly in Central Africa (Erickson, 1968; Lowrie, 1987; Clarke, 1879; Degreef, 1991). The New Zealand plants strongly resemble the green-rosetted, pink-petalled variety found in eastern New South Wales (Gibson, 1992b).

### ***D. pygmaea***

*Drosera pygmaea* is the smallest sundew native to New Zealand with rosettes

around 1 cm diameter (Salmon, 1991a). Two variants have been found, the most common has dark red leaves and scapes, and an all-green form has been found in the centre of the North Island, but its taxonomic status has not yet been determined (Maulder, 1991). The species has a prominent silvery-white stipule bud, which protects the growing point from desiccation and damage. Single flowered scapes are produced over the summer, and gemmae are probably produced in late autumn to mid-winter, although the exact details of these have yet to be published.

This species has only been reported from the North Island (Hooker, 1853) (Fig. 2D.), particularly north of Auckland (Salmon, 1991a; Anon, 1987; Rowe, 1986). It is often found growing with, or near, *D. auriculata*, *D. binata*, *D. peltata*, *D. spatulata*, and *U. novae-zelandiae*, in a range of habitats, all at low altitude, including grassland, swamps and lake edges (Salmon, 1991a; Anon, 1987; Rowe, 1986). *Drosera pygmaea* is also found across the Tasman sea in eastern and south-eastern Australia, Tasmania and south-west western Australia (Lowrie, 1989).

### **D. spatulata**

*Drosera spatulata* is a widespread perennial, spatulate-leaved species which occurs throughout New Zealand (Fig. 2D.). Two distinct forms occur. The most common is the "New Zealand Form" (Slack, 1980), which grows to 4 cm diameter. The leaves have a distinctive narrow, straight-sided petiole to 8 mm long, which lacks retentive glands on the basal half. The lamina are 5 mm long by 4 mm wide. During winter these plants go dormant in cold habitats. Scapes, to 8 cm tall, are produced from early summer, and on average bear 6 flowers each in a one-sided raceme. The inconspicuous white-petalled flowers are up to 6mm diameter (Salmon, 1991a).

An unusual form, with potential subspecies status, has been found between Turangi and Waiouru along the Desert Road, in the centre of the North Island, by Bruce Salmon (1988). The few-leaved, vivid red rosettes, to 1cm diameter, grow in small colonies in damp peat and clay soil. It over-winters as a dormant bud between June and September, and produces a scape to only 1cm tall. In cultivation, in warmer Auckland, this form grows to 2.5 cm diameter and is still winter-dormant. This form may be identical to variety "pusilla", from Lake Taupo and the foot of Tongariro, which is described only as "scapis 1-3 floris, sepalis latioribus" (Hooker, 1853, page 20). It is not said whether the plants are deciduous or evergreen.

The typical form of *Drosera spatulata* in new Zealand is found throughout the North, South and Stewart Islands (Hooker, 1853; Wilson, 1978), in sunny, permanently wet locations from coastal swamps to alpine sphagnum swamps, to approximately 1250 metres elevation (Burrows, 1986). *Drosera spatulata* is also found in eastern Australia, and South East Asia, as far north as Japan (Erickson, 1968). A number of distinct forms occur throughout its range (Slack, 1980). Genetic studies of some populations has yield data which suggests that this species evolved in New Zealand, and then spread west and north (Degreaf, 1989). It is not yet certain when this migration began, before or after New Zealand became separated from Gondwana approximately 65 M.A. (White, 1990), which would have profound implications on the age of this species.

### **D. stenopetala**

*Drosera stenopetala* is a perennial, winter-deciduous species endemic to New Zealand. It forms a rosette of up to 10, or more, spatulate leaves from spring to early autumn, which arise from a short underground rhizome (Hooker, 1853). The leaves are up to 10 cm long, with a glabrous petiole to ca. 80 mm long by ca. 4 mm wide, surmounted by an ovate lamina to 15 mm long by 6 mm wide. A single-flowered scape rises above the rosette and is open between December and February. The white-petalled flower has a large ovary surmounted by three deeply-divided styles (Birmingham, 1983; Hooker, 1853). This species forms a dormant bud in early Autumn, the nature of which has yet to be described in the literature, and will be a function of the



nature of growth habit of the leaves.

*Drosera stenopetala* is found in the North, South, Stewart, Auckland (50 40'S, 166 05'E) and Campbell (52 30'S, 169 00'E) Islands (Diels, 1906) (Fig. 2A.). In the latter two localities a few small plants have been found on Campbell Island (Laing, 1909), but it is quite common in lowland bogs in the Auckland Islands (Johnson and Campbell, 1975), where the generally small plants have initially been difficult to identify, and bear a strong resemblance to the closely related *D. uniflora* (Hooker, 1847 and 1853). In general this species grows in montane and sub alpine areas, in tarns, swampy areas and occasionally on wet rock faces, which all have constantly flowing water. It has a preference for shaded swampy areas, and is often found with *D. arcturi*, but never with *D. spatulata* (Birmingham, 1983).

This species extends to higher altitudes (to 1800 metres (Burrows, 1986)), and latitudes than *D. arcturi*, and therefore appears to be more cold-tolerant. Its presence on Auckland and Campbell Islands may reflect the longevity of this species. I speculate that it grew on the emergent Campbell Plateau prior to its almost complete submergence in the Eocene Epoch (57.8-36.6 M.A.) (White, 1990). It is part of a diverse flora, which is now limited to the highest, currently emergent, parts of it. The relatively large pyriform seeds do not appear conducive to wind transport.

*Drosera stenopetala* is one of the three species (with *D. arcturi* and *D. uniflora*) which comprise section *Psyochila* (Diels, 1906) which is restricted to cold temperate areas of Australia, New Zealand and South America. All three species display many characters which are regarded as primitive, and also show a Gondwanan distribution. This is supported by the discovery of fossilized pollen of *Drosera arcturi*, and its ancestor "Dreridites tholus", in early Eocene sedimentary rocks in Tasmania (Macphail, 1988).

### ***Utricularia australis***

*Utricularia australis* is a robust aquatic bladderwort of variable stature, which is generally shy to flower. The variability has led to this species being described as endemic species, *U. protrusa* and *U. mairii* (Taylor, 1989). The basely-bifurcated much-divided leaves grow to 6 cm long, with green to black bladders to 4 mm long. The stem segments grow to over 4 metres long, but are often shorter, and float at, or up to 1 metre below, the water surface (Maulder, 1984b). Scapes develop from December to March, which may develop en-masse in particular lakes, and can develop floats (Maulder, 1984b). One to three scapes are produced per plant, which have up to eight, small, completely yellow flowers each (Maulder, 1985c) which may be aborted at any stage of their growth (Maulder, 1984b). The species forms turions in response to desiccation and unfavourably cold (winter) temperatures (Maulder, 1984b; Taylor, 1989).

Despite the abundance of lakes and streams in New Zealand, *U. australis* is an uncommon species. It has been found in the northern half of the North Island and has been record from one location on the west coast of the South Island (Moar and Mason, 1976) (Fig. 2E.). Perhaps the raised mineral concentrations in many lakes and rivers in the North Island, due to geothermal activity, makes many otherwise suitable habitats toxic to this species? At present the species most commonly found in lakes north of Auckland (Salmon, 1991a; Rowe, 1986; Maulder, 1985c; Maulder, 1984b), and sometimes grows with *U. gibba* (Maulder, 1984b). *Utricularia australis* also occurs in Australia, tropical and temperate Asia, tropical and temperate Africa, and Europe (Taylor, 1989).

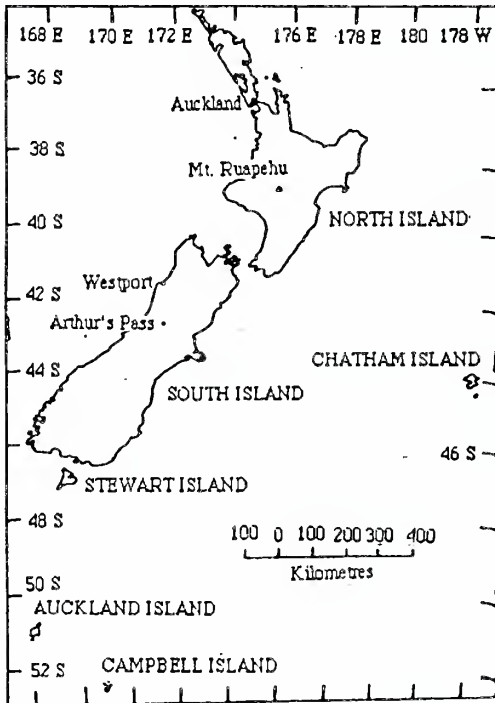
### ***U. delicatula***

*Utricularia delicatula* is endemic to New Zealand, and is very similar to *U. lateriflora* from south-eastern Australia (Taylor, 1989), and has been confused with it in the past (Boon, 1990; Salmon, 1991a). It is a small, terrestrial *Utricularia* with small, bright green spatulate leaves to 10 mm long, by 1mm wide (Salmon, 1991a)

which are easily overlooked. The slender purple scapes, to 10 cm tall, have one to four alternately arranged tiny flowers, which are produced from mid-November (Rowe, 1986), to February (Taylor, 1989). The flowers are white, rarely with a subtle blue tinge on the lower lip (Salmon, 1991a). This species is confined to the northern half of the North Island, especially in the far north (Salmon, 1991a; Rowe, 1986) (Fig. 2F.).

#### *U. gibba*

*Utricularia gibba* is the other species of aquatic bladderwort in New Zealand, about which little has been written. This generally small species flowers prolifically from January to March (Maulder, 1984b). It has been recorded at Bethell's Swamp, north-west of Auckland as *U. biflora*, and considered an introduced water weed (Boon, 1990). However, this species also occurs in eastern Australia and New Caledonia which open up the possibility for natural introduction by migratory water birds. This view may be supported by the fact that this wide-ranging species is also found in temperate and tropical Africa and the Americas, as well as western Europe, the eastern



**Figure 1:** Location Map of New Zealand and the nearby Auckland, Campbell and Chatham Islands.

Mediterranean shore, and South East Asia (Taylor, 1989).

#### *U. monanthos*

*Utricularia monanthos* is widespread in New Zealand (Fig. 2F.), especially in the South Island, and occurs also in Stewart Island (Wilson, 1987), the most southerly location for the genus (Taylor, 1989). It grows in wet areas, mainly in higher altitudes, but occurs at sea-level at the southern end of its range. The summer-produced, predominantly single-flowered scapes grow from 3 to 10 cm tall, and support a lavender purple flower, to 7mm across, with a yellow ridges on the palate, which are large in comparison to the sometimes winter-deciduous leaves (Salmon, 1991b; Maulder, 1985a; Jenks, 1983). This species is variable in stature, which has caused some taxonomic confusion with the very similar *U. dichotoma* (Taylor, 1989). The latter species does not occur in New Zealand, and unconfirmed reports of it at Westport, South Island (Salmon, 1990), may be robust *U. monanthos* plants.

This species also occurs in Australia, where it is found in alpine, and sub-alpine areas of the Snowy Mountains, and throughout the central plateau of Tasmania (Erickson, 1968).

#### *U. novae-zelandiae*

*Utricularia novae-zelandiae* is found throughout the North Island (Fig. 2F.) and less-commonly, in all but the south-west portion of the South Island, and also occurs in New Caledonia. The endemic *U. colensoi*, *U. subsimilis*, *U. vulcania* and *U. sp. "Lake Ohia"*, from the North Island have been reduced to synonymy (Taylor, 1989; Maulder, 1985b). It is close to *U. monanthos*, but differs primarily in flower colour, palate

structure and the distinctly upturned edge of the lower lip. The dark purple scapes are produced from November (Maulder, 1985b), to February (Taylor, 1989), and support 1 or 2 white flowers to 8 mm across. The ridges of the palate are yellow, edged red, and red veins occur in the upper lip (Salmon, 1991b).

This species has been recorded close to sea-level in the northern tip of New Zealand (Rowe, 1986), as well as at an unspecified altitude on Mount Ruapehu, in the centre of the North Island, where it may hybridize with *U. monanthos* (Salmon, 1991b).

The conservation status of the native carnivorous plants of New Zealand is mixed. The widespread species *D. arcturi*, *D. auriculata*, *D. binata*, *D. pygmaea*, *D. spatulata*, *D. stenopetala*, *U. novae-zelandiae* and *U. monanthos* are not threatened. However, the less-widespread *D. peltata*, *U. australis*, *U. delicatula* and *U. gibba*, which are primarily found in the northern half of the North Island have a less-secure future. Farming activities, including draining swamps, and the application and runoff of fertilizers, as well as some recreational watersports have already depleted or destroyed historically good carnivorous plant sites (Salmon, 1991a; Rowe, 1986; Maulder, 1985a).

All native species occur in the North Island, with the highest concentration in the far north. With the possible exception of *D. auriculata*, which can reverse its growing and dormant seasons, those species on the South Island are summer-growing and winter dormant/ deciduous. This distribution may reflect the extensive Quaternary glaciation of the South Island, and voluminous explosive volcanism in the centre of the North Island (White, 1990).

The carnivorous plants of New Zealand show strong overlap with those species found in eastern Australia, which probably reflects migration across the Tasman Sea, and the possibility that some species predated the breakup of Australia, Antarctica and New Zealand. Several species have begun to evolve in isolation into distinctive New Zealand forms, which includes two endemic species (*D. stenopetala* and *U. delicatula*). It is hoped that this review has painted a general picture of the native carnivorous plants of New Zealand, and that it will generate the publication of additional information from those with the means to observe these plants in the wild.

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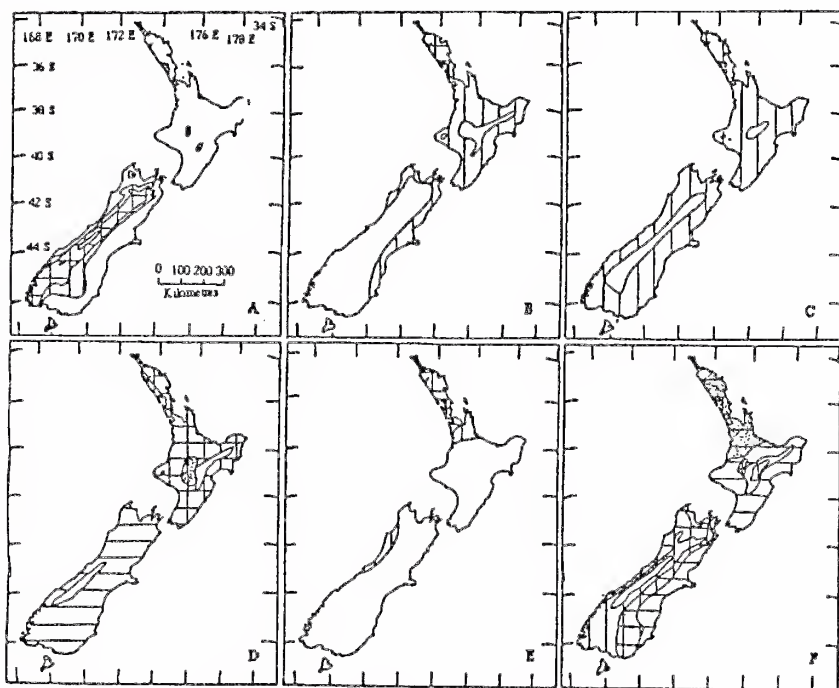
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**Figure 2:** Approximate distribution maps of the native New Zealand carnivorous plants: (A) *Drosera arcturi* (vertical stripes) and *D. stenopetala* (horizontal stripes); (B) *D. auriculata* (vertical stripes) and *D. peltata* (horizontal stripes); (C) *D. binata* (vertical stripes); (D) *D. pygmaea* (vertical stripes), *D. spatulata* (horizontal stripes) and *D. spatulata* var. *pusilla* (stippled); (E) *U. australis* (vertical stripes) and *U. gibba* (horizontal stripes); and (F) *U. delicatula* (stippled), *U. monanthos* (vertical stripes) and *U. novae-zelandiae* (horizontal stripes). Note that *D. binata* also occurs on Chatham Island and *D. stenopetala* also occurs in the Auckland and Campbell Islands, shown in Figure 1.

# Literature Review

**Lenz, Richard J.** 1994. Marcia R. Cohen portfolio no. 1: Genus *Sarracenia*. Georgia Wildlife 4:12-17.

This article briefly describes the function of sarracenias, but mainly features the sarracenia art of Marcia Cohen which has been mentioned in reviews in previous issues. Ms. Cohen spent three years in the field producing her pastels with color pencil and they are accurate and beautiful. The production is nicely done with quality publishing in this relatively new state wildlife magazine. Ms. Cohen's artwork will begin gracing these pages as well.

**Gagliardo, Ron.** Atlanta Botanical Garden carnivorous plant collection.

**Kanel, John de and Rolfe Smith.** The *Nepenthes* collection at Longwood Gardens.

**Gardner, Rob.** The carnivorous plant collection at the North Carolina Botanical garden.

**Mellichamp, T. Lawrence.** *Sarracenia* hybrids—American style. 1994. The Public Garden. 9:36-39(plus tails).

This is a group of four articles on CP collections at four public gardens. The magazine is published by a consortium of botanical gardens. In addition to a brief summary of a sentence or two on each garden, I (DES) will also give my impressions since I have visited all of them.

There is little we need to add about the Atlanta Botanical Garden since we have written it up several times in these pages. The author, who just joined the Garden to work principally with tissue culture, describes the public indoor displays as well as the outdoor southern coastal plain bog exhibit. These are easily publicly accessible. Less accessible, is the greenhouse or "prop house" area where unexhibited species—often of great interest—arid propagation occur. These places are generally less accessible in most gardens. However those identified with particularly serious interest in CP may be admitted if you can catch Ron Determann or Ron Gagliardo. The displays are excellent.

Longwood has reduced to a modest public display of *Nepenthes* since, as the author admits and I have found from other sources, the Garden is reverting to horticultural displays as its main mission. The small terrarium display of other CP I saw there a couple of years ago is in very poor condition, and admission to the prop area is nearly impossible.

The North Carolina Botanical Garden is entirely open—All CP are displayed. There is an artificial coastal plain habitat, labeled pots in a greenhouse area which are portable for moving exhibits around town, and a larger area of sunken pots. In addition to CP, the Garden is a fine example of native plant gardens.

Larry Mellichamp's place at the University of North Carolina at Charlotte has all displays open to the public. The CP display is heavy on sarracenias which are being used to develop horticulturally desirable hybrids, some containing as many as six species. Larry emphasizes his growing methods which include plenty of light and salts-free water, and a medium consisting of 2 parts peat 1 part perlite and 1 part vermiculite with light liquid fertilization every three weeks during the growing season. As a bonus, the visitor may also see the extensive native plant garden on a wooded hillside that features many naturalized species of rhododendron.

In summary, at present, visits to Atlanta, Chapel Hill and Charlotte are well-worth a special effort. Stop at Longwood if you are in the neighborhood.

## SPECIAL NOTICE

The editors of CPN have decided that it is time to incorporate officers into the society as described by our bylaws. In these bylaws, 3 officers are required; president, vice-president and secretary-treasurer. We think the best method of getting nominees for these officers is through the local CP chapters that have sprung up in recent years around the United States. Later we will include other countries but for now, because of time constraints, it is more expedient to focus on members from this country.

We are asking each CP chapter in this country to submit one candidate name for each of the above offices. We estimate that we would obtain 4-6 nominees for each office. A ballot with these names will be with the December issue of CPN. Members will vote for a candidate from each office and mail the ballot to Editor Steve Baker who will tabulate the results.

You can write or e-mail your candidates into Steve's address which appears below. We would appreciate that all nominees be in by **September 15th** to give us time to contact them and perhaps obtain a short statement on how they can help our organization plan for the future.

Basically, officers run for two years and meet annually either by phone or at a regional meeting to discuss the agenda. There are several issues that we are aware of that will affect this organization in the future and they should be resolved soon.

We thought it would be useful to have a list of all of the CP clubs or groups in the USA to publish in CPN. When you send in your list of nominees please mention the name of the club or group also included the name and address of the person to contact and there e-mail address if available.

Steve's street and email address is on the front inside copy under editors.

## SPECIAL NOTICE NEW PRICES FOR BACK CPN ISSUES

Over the years, we have accumulated a large inventory of back issues of CPN magazine which is becoming a serious storage problem. So, we are making a generous offer to reduce this inventory by reducing the prices of ten years of the past issues.

CPN issues from 1978 to 1987, (vol 7 to vol 17) will now cost \$8.00 per volume, a discount of over 60% from the previous price. Now this offer only applies to the above mentioned issues because the CPN issues from Vol 18 to vol 22 remain the same, i.e. \$12.50 per vol. Issues of CPN from Vol 1-6 are available on demand since these are copied from the original issues which are no longer available. The price of these will be also \$8.00 per volume.

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